A New Algorithm for Face Localization and Face Features Extraction Based on Voronoi Diagram and Parametric Contour

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Abstract

Recognition of human faces out of many still images is a research field of fast increasing interest, and a fast and accurate algorithm is still a field to be explored. Our proposed approach in this research is based on Voronoi Diagram and contour linearization. We use the former for we want to locate a probable region of faces and to compensate for some drawbacks of the parametric contour method.

1. The Proposed Technique

1.1 Voronoi Tessellations for Image Segmentation

Firstly, and before attempting any operation we perform a histogram equalization to reduce the lighting mal effect, this is referred to as preprocessing step. A VD is constructed from feature points which are result of gray intensity values summations. The second alteration is to construct the Delaunay Triangulations (DT) from VD. The outer boundary of DT is simply the convex hull of the set of the featured points. A set of unique dot patterns are obtained and then sorted in ascending order to form ranges from which decision of merging and splitting regions is based. These ranges are but clustering homogeneous pixels. A final segmentation example is depicted in (fig1-3). A brute force is applied to each range to yield labeled connect regions. When filling all holes in the image, a total -or in worst case majority- of skin tone region (face and neck) is formed. The region of low-density are of no interest to us e.g.: eliminating of small objects in the background The ROI will be evaluated based on Ellipse best Fitting, aspect ratio of the major and minor axes and symmetrical line.

1.2 Face Features Extraction

VD/DT is applied again but this time to find the geometrical measurement between face features, by calculating the radius of the circle passing through each centroid point of each feature. The radius over a common value will yield an invariant measurement to scale, rotation, and translation

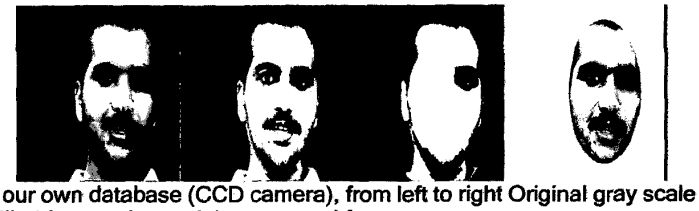

Fig 1: Test result on our own database (CCD camera), from left to right Original gray scale Image, Segmented image, filled face region and the extracted face.

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Fig 2: The BioID Face Database results, the above corresponds to "BioID_0897.pgm" and at the bottom "BioID_0925.pgm"

Fig 3: Test result on still image from the World Wide Web.

2. References

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